PROPOSED

Species at Risk Act
Recovery Strategy Series

Recovery Strategy for the Spalding's Campion (*Silene spaldingii*) in Canada

Spalding's Campion

2016

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For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry[1].

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[1] http://www.registrelep-sararegistry.gc.ca

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[2] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years after the publication of the final document on the SAR Public Registry.

The Minister of the Environment is the competent minister under SARA for the Spalding's Campion and has prepared this strategy, as per Section 37 of SARA. To the extent possible, it has been prepared in cooperation with the Province of British Columbia.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Spalding's Campion and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment Canada and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When the recovery strategy identifies critical habitat, there may be future regulatory implications, depending on where the critical habitat is identified. SARA requires that critical habitat identified within federal protected areas be described in the *Canada Gazette*, after which prohibitions against its destruction will apply. For critical habitat located on federal lands outside of federal protected areas, the Minister of the Environment must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies. For critical habitat located on non-federal lands, if the Minister of the Environment forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, and not effectively protected by the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to extend the prohibition against destruction of critical habitat to that portion. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

[2] http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2

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Executive Summary

The Canadian population of Spalding's Campion (*Silene spaldingii*) was assessed as Endangered in May 2005 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and in February 2010 the species was listed on Schedule 1 as Endangered under Canada's *Species at Risk Act* (SARA).

Spalding's Campion is a perennial herb in the Caryophyllaceae family (Pinks), and is endemic to Washington, Oregon, Idaho, Montana, and southeastern British Columbia (B.C.) (Douglas and MacKinnon 1998). In its Canadian range, Spalding's Campion is found in open to semi-open mesic (moist) grasslands and sagebrush-steppe communities dominated by bunchgrasses such as Rough Fescue (*Festuca campestris*). It exhibits a habitat preference for slopes less than 10%, northern aspects, and grasslands with scattered and/or encroaching conifer growth (Keefer and Kennedy 2010).

In Canada, Spalding's Campion is only known from one population in the East Kootenay region near Grasmere, B.C. The Canadian population is currently understood to have at least 1,059 individuals (Keefer and Kennedy 2010). The primary threat to Spalding's Campion is ongoing habitat loss and degradation primarily from introduced invasive alien plants, and successional change/encroachment caused by altered fire regimes. Other threats include habitat loss due to development, damage from recreational vehicles, grazing and trampling by domestic livestock, and herbicide drift.

The population and distribution objectives for Spalding's Campion in Canada are to maintain, and where appropriate, increase the abundance of Spalding's Campion occurrences throughout its range in Canada, including any new occurrences that are identified. Broad strategies to address threats to the survival and recovery of Spalding's Campion are presented.

This recovery strategy identifies critical habitat for the Spalding's Campion in Canada to the extent possible, based on the best available information available at this time. Critical habitat for Spalding's Campion in Canada is identified as the area occupied by individual plants or patches of plants that have been recorded, including the geographical uncertainty distance, plus an additional 50 meters (critical function zone) to encompass immediately adjacent areas. A schedule of studies needed to further identify critical habitat is also included, and activities likely to result in the destruction of critical habitat are described.

One or more action plans for the Spalding's Campion will be posted on the Species at Risk Public Registry by 2021.

Recovery Feasibility Summary

Based on the following four criteria that Environment Canada uses to establish recovery feasibility, the recovery of Spalding's Campion (*Silene spaldingii*) is considered to be technically and biologically feasible:

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

   Yes. Plants in the Canadian population, when not dormant or in the rosette stage, are capable of reproduction, and have been observed to produce seeds.

2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.

   Yes. Sufficient suitable habitat is available to support the species. While Spalding's Campion requires somewhat specialized habitat, there are unoccupied areas that could be made available to additional or restored populations, with appropriate habitat management and threat mitigation.

3. The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.

   Yes. The primary threats to the species and its habitat (spread of invasive alien plants, and successional change/encroachment caused by altered fire regimes) can be avoided or mitigated through the ecosystem restoration and management techniques described.

4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.

   Yes. Recovery techniques exist and are demonstrated to be effective. Primary recovery techniques for Spalding's Campion will include invasive alien plant species control, and removal of encroaching vegetation to improve and/or maintain habitat for the species. Over the long term, appropriate habitat management will promote continued restoration through mitigating additional threats of grazing, development, and use of off-road vehicles, and reducing habitat fragmentation.

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1. COSEWIC* Species Assessment Information

Date of Assessment: May 2005

Common Name: Spalding's Campion

Scientific Name: *Silene spaldingii*

COSEWIC Status: Endangered

Reason for Designation: This long-lived perennial herb is a globally imperilled species restricted to two small areas west of the Rockies with only a single population in southern British Columbia. The Canadian population is one of the largest populations known but may contain fewer than 250 mature plants. These plants are at risk from on-going habitat loss and degradation especially by introduced weeds.

Canadian Occurrence: British Columbia

COSEWIC Status History: Designated Endangered in May 2005.

* COSEWIC: Committee on the Status of Endangered Wildlife in Canada

Additional information on the population abundance of Spalding's Campion has been gathered since the 2005 COSEWIC assessment. Surveys completed in 2010 confirmed a population of at least 1,059 individuals (Keefer and Kennedy 2010).

2. Species Status Information

Legal Status: SARA Schedule 1 (Endangered) (2006)

Table 1. Conservation Status for Spalding's Campion (NatureServe 2014, USDA NRCS 2014, BC CDC 2014).

Global (G) Rank	National (N) Rank	Sub-national (S) Rank	COSEWIC Designation	B.C. List	B.C. Conservation Framework
G2* (2003)	Canada (N1), United States (N2)	Canada: British Columbia (S1); United States: Idaho (S1), Montana (S1), Oregon (S1), Washington (S2)	Endangered (2005)	Red	Highest priority: 1, under Goals 1 & 3**

* Rank 1-critically imperiled; 2-imperiled, 3-vulnerable to extirpation or extinction; 4-apparently secure; 5-secure; H-possibly extirpated; NR-status not ranked

** The three goals of the B.C. Conservation Framework are: 1. Contribute to global efforts for species and ecosystem conservation; 2. Prevent species and ecosystems from becoming at risk; 3. Maintain the diversity of native species and ecosystems

The percentage of the global range of Spalding's Campion found in Canada is not assessed, however based on US Fish and Wildlife Service (2007) range description it could be less than 1%.

3. Species Information

A large portion of the text in this section and those following is adopted and/or adapted from the "Recovery Strategy for Spalding's Campion in British Columbia" (BC Southern Interior Rare Plants Recovery Implementation Group 2008). Information has been updated where applicable and appropriate.

3.1 Species Description

Spalding's Campion (also known as Spalding's Catchfly) is an herb with an erect stem 20–60 cm tall, and an inflorescence of several greenish-white flowers in a leafy cluster (Figure 1). The outer, green portion of the flower forms a tube (calyx) about 1 cm long with 10 distinct veins running its length. The flower consists of five petals, each with a long narrow "claw" that is largely concealed by the calyx, and a very short "blade," or flared segment at the end of the claw. The stem has four to seven pairs of stalk-less, lance-shaped leaves. The light green foliage and stem are typically densely covered with sticky hairs (hence the term "catchfly"). The fruit is a 10–15 mm long capsule with a single chamber that holds numerous small seeds (Hitchcock et al. 1964; Douglas and MacKinnon 1998). Flowering begins in July and continues into September.

It has two distinctly different growth forms: rosettes and erect stems (vegetative and reproductive forms, respectively) (Figure 1). The rosettes often die back in the hot summer months, which can make detection of the species difficult. It also exhibits periods of dormancy where the foliage dies back completely and only the caudex and taproot remain underneath the soil. Dormancy in individual plants has been recorded to last up to 6 years, though it is more commonly 1-2 years (Lesica and Crone 2007).

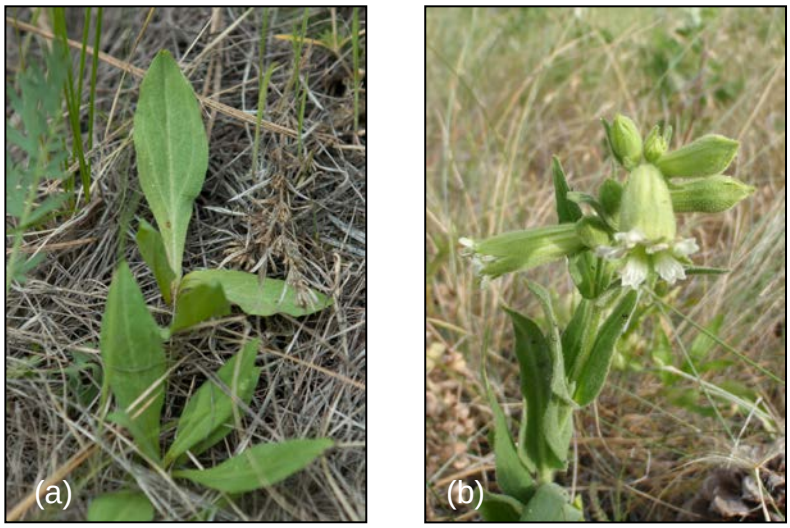

Figure 1. Spalding's Campion growth forms: (a) rosettes, (b) erect stems (reproductive plant). Photos by Mike Keefer.

3.2 Population and Distribution

Globally, Spalding's Campion is a regional North American endemic ranging from south-eastern British Columbia and adjacent areas in northwestern Montana, west-central Idaho, eastern Washington, and northeastern Oregon (Figure 2). In Canada, Spalding's Campion is found only in the extreme southeast of B.C. It represents only one population[3] and its distribution is limited to a few square kilometers in the northern part of the rolling landscape of the Tobacco Plains. Individuals occur primarily on the Tobacco Plains Indian Reserve, with some occurrences on adjacent private and provincial Crown lands. The Canadian population is located approximately 1.3 kilometers north of the closest U.S. population, located in Montana, and is likely a satellite population of this larger population to the south (COSEWIC 2005).

At the time of the COSEWIC assessment (2005), a single population of fewer than 250 plants was thought to represent the entire Canadian contingent of Spalding's Campion. Three populations (comprised of six subpopulations) were described in the 2008 provincial recovery strategy, with a similar total of between 150-250 flowering plants. In subsequent years, more individuals were found. Surveys completed in 2010 confirmed at least 1,059 total individuals, all within one 1 km of each other and thereby constituting one population (Keefer and Kennedy 2010). A predictive habitat model developed by Keefer and Kennedy (2010) indicated there might be many more individuals (e.g. up to 10,000, or possibly more) growing in unsurveyed suitable habitat through much of the Tobacco Plains Indian Reserve. Knowledge of Spalding's Campion extent and abundance are likely to change with further search efforts.

[3] Individuals within 1 km of each other are considered to be part of the same population. Within a population, individuals or groups of individuals separated by >1km are conceptualized as subpopulations within the larger population (NatureServe 2012).

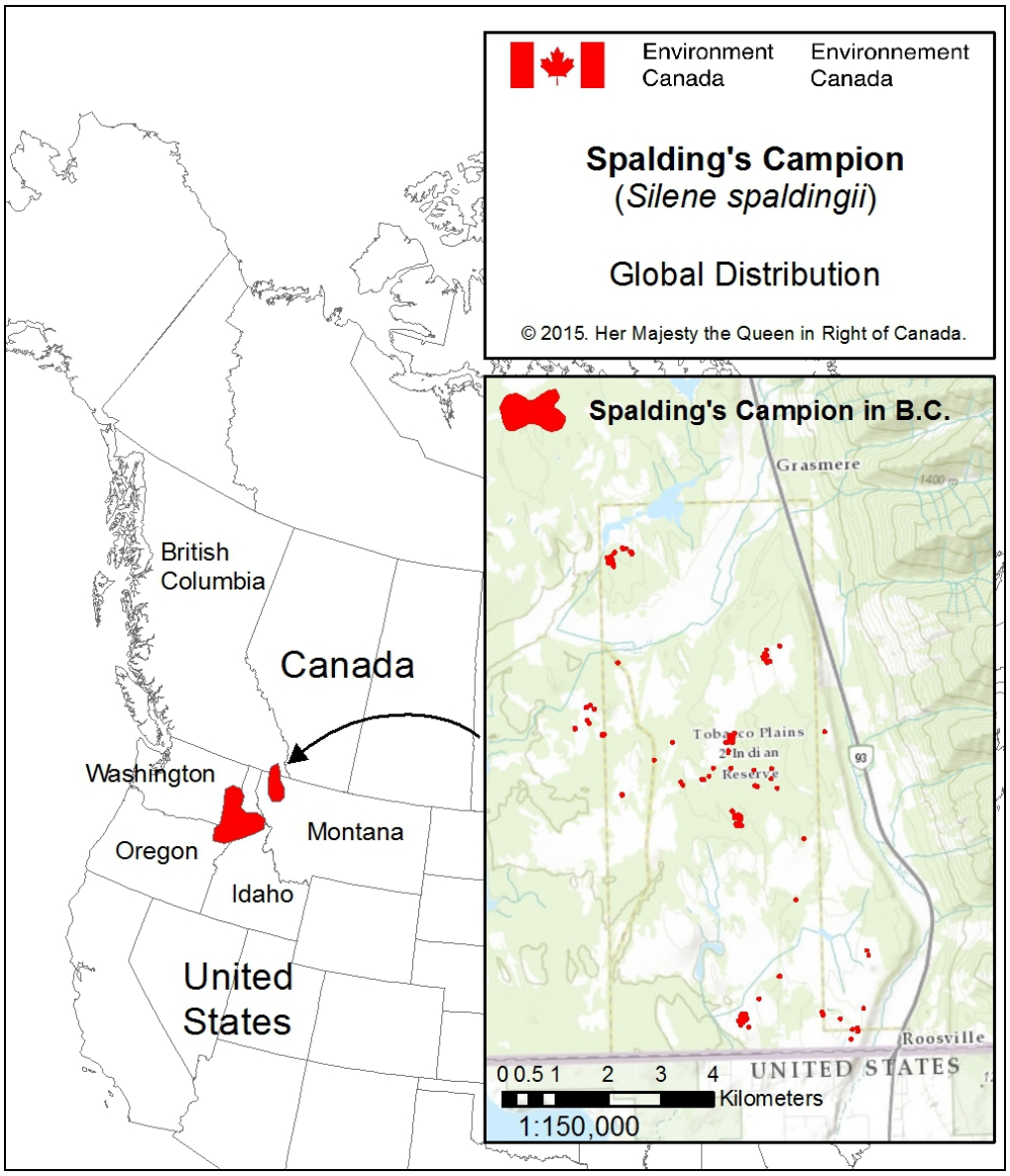

Figure 2. Global Distribution of Spalding's Campion.

3.3 Needs of the Spalding's Campion

Spalding's Campion is primarily associated with the bunchgrass grasslands that extend from Washington and Oregon into parts of Montana and adjacent B.C. The Tobacco Plains, which host the southern B.C.– northern Montana metapopulation, are part of the Intermontane Valley region between the Purcell and Salish mountains to the west, and the Whitefish Range on the east. These valleys are transitional between the Palouse Prairie typical of the Columbia Basin and the grasslands of the northern Great Plains in the U.S. (Antos et al. 1983; Hill and Gray 2004). The B.C. portion of the Tobacco Plains within the dry hot subzone of the Ponderosa Pine biogeoclimatic zone, where the climate is characterized by cool winters, moderately warm summers, and

winter-low/summer-high precipitation patterns (Meidinger and Pojar 1991). The terrain is characterized by gently rolling glacial kettle–moraine topography.

The native plant community at Tobacco Plains consists predominantly of fescue grasslands (Mincemoyer 2005), which are characterized by the following: (1) dominance by perennial bunchgrasses of which a fescue (*Festuca*) is typically a major component; (2) a varied and conspicuous forb component; (3) often a shrub component, occurring as scattered, dwarfed individuals or taller patches; (4) a well-developed cryptogam (lichen/moss) layer; and (5) occasionally scattered trees (Hill and Gray 2004). In Tobacco Plains, Spalding's Campion is frequently found in the Rough Fescue habitat type and associated with Richardson's needlegrass (*Achnatherum richardsonii*). This community is dominated by Rough Fescue (*Festuca campestris*) and Idaho Fescue (*F. idahoensis)*, and includes other grasses such as Prairie Junegrass (*Koeleria macrantha*). Woody species include scattered Ponderosa Pine (*Pinus ponderosa*) and Woods' Rose (*Rosa woodsii*) (Hill and Gray 2004). Associated forbs include Timber Milk-vetch (*Astragalus miser*), Bergamot (*Monarda fistulosa*), Columbia Gromwell (*Lithospermum ruderale*), Old Man's Whiskers (*Geum triflorum*), and Silky Lupine (*Lupinus sericeus*).

In B.C., habitat for Spalding's Campion occurs within the rolling grasslands west of the Roosville border crossing. Within this area, Spalding's Campion grows in relatively open, unshaded habitats, such as open range and open forest of Ponderosa Pine. Optimal microhabitat conditions are slopes less than 10% and with a northerly aspect (Keefer and Kennedy 2010, US Fish and Wildlife Service 2007). The open landscape where Spalding's Campion occurs was likely maintained through natural or managed wildfires, historically. More recent fire suppression has led to increased encroachment by woody species, and concomitant loss of suitable habitat for the species. It is likely that additional suitable habitat (particularly at sites with suitable slopes and aspects) has been lost owing to expansion and competitive exclusion by large populations of invasive plant species.

Longer and more frequent droughts associated with climate change could adversely affect Spalding's Campion, possibly resulting in the extirpation of small populations. Several studies have found that prolonged or repeated drought conditions contribute to higher rates of mortality; smaller seed set, and extended dormancy (U.S. Fish and Wildlife service 2001, Hill and Gray 2004, Heidel 1995). While dormancy is an important life history strategy in semi-arid environments, the number of years for which individuals may remain dormant is limited, and death is thought to occur after two or three years (Lesica 1997). Additionally, this species likely lacks a long-term seed bank due to the lack of a hard outer seed coat (Lesica 2007) so lack of germination due to moisture constraints over multiple years could have significant effects on the viability of small populations. More research is needed to determine impacts associated with climate change and/or weather variables such as prolonged drought.

4. Threats

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational) (Salafsky et al. 2008). For purposes of threat assessment, only present and future threats are considered.[4] Threats presented here do not include biological features of the species or population which are considered limiting factors.[5]

4.1 Threat Assessment

The threat classification below (Table 2) is based on the IUCN-CMP (International Union of Nature–Conservation Measures Partnership) unified threats classification system. This IUCN-CMP threat assessment system is currently used by the B.C. Conservation Framework and the B.C. Conservation Data Centre. For a detailed description of this classification scheme, see the Conservation Measures Partnership website[6] (CMP 2010).

[4] Past threats may be recorded but are not used in the calculation of Threat Impact. Effects of past threats (if not continuing) are taken into consideration when determining long-term and/or short-term trend factors (Master et al. 2009).
[5] It is important to distinguish between limiting factors and threats. Limiting factors are generally not human induced and include characteristics that make the species or ecosystem less likely to respond to recovery/conservation efforts.
[6] http://cmp-openstandards.org/using-os/tools/threats-taxonomy/

Table 2. Threat assessment summary for Spalding's Campion in Canada.

Threat #	Threat description	Impact[1]	Scope[2]	Severity[3]	Timing[4]	Causal Certainty[5]
1	Residential & commercial development	Negligible	Small	Negligible	High	High
1.1	Housing & urban areas	Negligible	Small	Negligible	High	High
1.2	Commercial & industrial areas	Negligible	Small	Negligible	High	High
2	Agriculture & aquaculture	Unknown	Pervasive	Unknown	High	Low
2.3	Livestock farming & ranching	Unknown	Pervasive	Unknown	High	Low
6	Human intrusions & disturbance	Low	Pervasive	Slight	High	High
6.1	Recreational activities	Low	Pervasive	Slight	High	High
7	Natural system modifications	High	Large	Serious	High	High
7.1	Fire & fire suppression	High	Large	Serious	High	High
8	Invasive & other problematic species & genes	High	Pervasive	Serious	High	High
8.1	Invasive non-native/alien species	High	Pervasive	Serious	High	High
8.2	Problematic native species	Unknown	Unknown	Unknown	High	Low
9	Pollution	Unknown	Small	Unknown	Unknown	Low
9.3	Agricultural & forestry effluents	Unknown	Small	Unknown	Unknown	Low

Impact *– The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.*

[2] ***Scope*** *– Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).*

[3] ***Severity*** *– Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or 3-generation timeframe. Usually measured as the degree of reduction of the species' population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).*

[4] ***Timing*** *– High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.*

[5] ***Causal certainty*** *– Reflects the degree of evidence that is known for the threat (high: available evidence strongly links the threat to stresses on population viability; medium: there is a correlation between the threat and population viability e.g. expert opinion; low: the threat is assumed or plausible).*

4.2 Description of Threats

Following the methods of Master et al. (2009), the overall Threat Impact for Spalding's Campion was calculated as Very High[7], meaning the species is currently facing, or is expected to face in the medium-term, a median rate of population decline of 75%. Two "High" threats and one "Low" threat were identified. The threats for this species are described below, in approximate order of impact. The greatest threat is identified as invasive alien species.

IUCN-CMP Threat 8.1 Invasive non-native/alien species

The most serious current threat to Spalding's Campion (Table 2) results from the influences of invasive alien plants, which are found on or near many sites where Spalding's Campion occurs. Many invasive alien plant species have been recorded at Spalding's Campion sites in B.C., including Sulphur Cinquefoil (*Potentilla recta*), Spotted Knapweed (*Centaurea stoebe* ssp. *micranthos*), St. John's-wort (*Hypericum perforatum*), Leafy Spurge (*Euphorbia esula*), Hound's Tongue (*Cynoglossum officinale*), Canada Thistle (*Cirsium arvense*), Cheatgrass (*Bromus tectorum*), Canada Bluegrass (*Poa compressa*), Kentucky Bluegrass (*Poa pratensis*), Smooth Brome (Bromus inermis), Timothy (Phleum pratense), White Sweetclover (*Melilotus albus*), Yellow Salsify (*Tragopogon dubius*), and the invasive Yellow Hawkweed Complex (i.e., invasive alien species of *Hieraceum*). Some species (e.g. Timothy) are pasture grasses that may have been intentionally introduced for range fodder. Invasive alien plants threaten Spalding's Campion in four main ways: (1) by altering the composition, structure and function of the native bunchgrass communities that support it; (2) by increasing thatch buildup; (3) by altering microclimate and soil structure/chemistry; and (4) by directly competing for critical resources such as water, nutrients, pollinators, and germination safe sites (SIRPRIG 2008).

Substantial areas within Tobacco Plains grasslands have been converted to predominantly Cheatgrass or Canada Bluegrass, likely due to historical overgrazing by cattle and feral horses, but also deer (*Odocoileus* spp.) and elk (*Cervus elaphus*). Spalding's Campion has not been found on sites dominated by these two grasses (Keefer and Kennedy 2010). Some species, such as Spotted Knapweed, are allelopathic, emitting phytotoxins that restrict the growth of competing species (Rutledge and McLendon 1996). In surveys conducted in 2010, no Spalding's Campion plants were observed in microsites where Spotted Knapweed was growing, which could suggest allelopathic effects (Keefer and Kennedy 2010).

Prolific flowering by invasive plants can also result in increased competition for pollinator-visitation to Spalding's Campion plants. Reduced pollinator visitation has the potential to cause inbreeding depression, resulting in reduced fertility and fitness of the species and, ultimately, population declines (Lesica 1993). Such competition has been noted at a number of Spalding's Campion sites in Montana that have large populations

[7] The overall threat impact was calculated following Master et al. (2009) using the impact rating from each Level 1 Threat assigned to this species where Timing = High or Moderate. In this case that includes 0 Very High, 2 High, 0 Medium, and 1 Low (Table 3).The overall threat impact considers the cumulative impacts of multiple threats.

of St. John's-wort (Hill and Gray 2004). St. John's-wort has had steady expansion in B.C. rangeland since becoming established in the province around 1940 (Crompton et al. 1988).

IUCN-CMP Threat 7 Natural system modifications: 7.1 Fire and Fire suppression

In many habitats that were historically fire-maintained, such as the bunchgrass-fescue grasslands in southeastern B.C., fire suppression has resulted in natural ecological succession toward a more shrub- or tree-dominated habitat type. Woody encroachment can have multiple impacts on Spalding's Campion as habitats transition from open grassland or open forest to mature forest grassland ecosystems. While the species tolerates slight shade, it is unable to persist in the dense shade of a forest canopy that eventually results from encroachment. Ponderosa Pine saplings, the most common woody invaders, compete with Spalding's Campion for moisture and soil nutrients. Encroachment also reduces the amount of grassland available for grazing, causing increased grazing pressure on remaining open grassland sites. Other effects of fire suppression include heavy thatch buildup which can negatively affect survival, growth, reproduction, and recruitment of Spalding's Campion (Lesica 1999). When fire does occur, the intensity is increased by tree cover and thatch buildup, and can result in sterilisation of soils. Prescribed fire may have a positive effect on Spalding's Campion by removing litter and creating suitable sites for recruitment (Lesica 1999). However, in areas with invasive alien species, fire can actually favour their establishment over native plants (Lesica and Martin 2003). More research is needed to determine when prescribed burning is most beneficial to Spalding's Campion.

IUCN-CMP Threat 1 Residential & commercial development: 1.1 Housing & urban areas, 1.2 Commercial & industrial areas

All known B.C. occurrences of Spalding's Campion are on lands that do not appear to be at any immediate risk of loss by housing development and urbanization. However, habitat conversion in nearby U.S. jurisdictions may be reducing overall population viability. The Canadian population can be thought of as part of a larger population expanding northward from Montana. The stateside portion of this population occurs in an area where development and housing subdivisions are increasingly common. One of the Montana subpopulations is suspected to be extirpated due to residential development, as it has not been observed since 1986 (Mincemoyer 2005). Habitat for Spalding's Campion plants in the adjacent U.S. is expected to become increasingly fragmented and/or lost entirely as development continues in the years to come (Mincemoyer 2005). Although the impact of development in Canada is considered negligible, this trend in the U.S. could seriously reduce viability of the Canadian population. Lack of gene flow to the Canadian population via pollination and dispersal, inbreeding depression and population isolation are some concerns of habitat fragmentation in Spalding's Campion. These factors may increase the species' vulnerability to evolutionary and genetic constraints.

IUCN-CMP Threat 6 Human intrusions & disturbance: 6.1 Recreational activities

Recreational activities including off-road vehicle use as well as incidental trampling associated with camping, hiking, or other walking activities pose a threat to Spalding's Campion's grassland habitat. Off-road vehicles and trampling negatively affect overall grassland health by causing soil compaction and disturbance; fostering the introduction and spread of invasive plants; damaging native plants; and disrupting livestock management practices. The gentle rolling terrain that supports Spalding's Campion habitat can be attractive to off-road vehicle users and campers, and Canada's population of Spalding's Campion is located adjacent to a high-use recreational area on provincial Crown land. Historically, the recreational activities in this area were minimal but recent years have seen large increases in popularity. As the number of recreational users increases, the threat to Spalding's Campion's habitat also increases. Recreational off-road vehicle use in the BC interior has increased greatly in the past twenty years, a trend which is expected to continue as populations increase and the tourism industry develops (B.C. MWLAP and GCC 2004).This threat is currently of low impact due to the infrequency with which habitat is believed to be used for recreation, however actual usage is unknown and appears to be increasing.

IUCN-CMP Threat 2 Agriculture & aquaculture: 2.3 Livestock farming & ranching

Canada's population of Spalding's Campion occurs on land presently used for domestic livestock grazing (SIRPRIG 2008). Feral horses are also present at the site. The current grazing regime in Spalding's Campion habitat is unknown, though it is believed that historical overgrazing encouraged the spread of invasive alien plants that now threaten the habitat. However, sufficient research has not been completed to accurately assess the impacts of grazing and livestock trampling on this species (U.S. Fish and Wildlife Service 2007). In some cases, coupled with fire suppression in fire-adapted landscapes, limited grazing might have neutral or slightly beneficial effect on Spalding's Campion by reducing cover of competing vegetation and ground litter (Lesica 1999). However, grazing may also cause habitat loss and degradation depending on the timing of grazing, the degree of pressure, soil moisture, and possibly the soil chemistry/pH and nutrient regime. Heavy grazing pressure can reduce populations directly through consumption of plants and trampling (Gamon 1991), and indirectly by soil compaction and alteration of the composition and structure of the native plant communities that support them (U.S. Fish and Wildlife Service 2001). Conifer encroachment is believed to concentrate grazing animals' efforts in increasingly smaller areas, producing a further stress on grassland health. An additional concern is the potential of livestock to act as vectors for invasive plant dispersal (see IUCN-CMP Threat #8.1). Further research is needed to determine the impacts livestock grazing (including by feral horses) have on Spalding's Campion habitat in Canada.

IUCN-CMP Threat 9 Pollution: 9.3 Agricultural & forestry effluents

The threat of herbicide drift is present, but of unknown impact. Numerous invasive alien plant species found within the area of the Spalding's Campion population means a wide variety of herbicides may be in use. Unknown variables associated with this threat include herbicide type (residual or non-residual), application schedule, wind currents

and degree of controlled application. Herbicides are often instrumental in the control of invasive alien plants, and are likely to be a useful tool in the reclamation of habitat for this species. It is likely that impacts of this threat can be mitigated or avoided through appropriate use (i.e., timing, methodology) (Hill and Gray 2004).

IUCN-CMP Threat 8.2 Problematic native species

Adverse effects of grazing, trampling and herbivory of native animals and insects have not been sufficiently documented in the Canadian population of Spalding's Campion. Grazing and trampling by native herbivores is considered a threat in the U.S. (U.S. Fish and Wildlife Service 2001). Information from surveys completed in 2010 estimated 5% of foliage was lost to herbivory across one growing season (Keefer and Kennedy 2010). More research is needed to determine the effects of present levels of native herbivory by both animals and insects.

5. Population and Distribution Objectives

The population and distribution objective for Spalding's Campion in Canada is:

> *To maintain, and where appropriate, increase the abundance of Spalding's Campion occurrences throughout its range in Canada, including any new occurrences that are identified.*

Rationale: In Canada, Spalding's Campion is typically found in bunchgrass grassland ecosystems with rolling glacial kettle–moraine topography and the Rough Fescue-Ponderosa Pine vegetation type. Owing to the small amount of this habitat type in Canada, it has a naturally very restricted range. Abundance and distribution information for this species shows one confirmed extant population (Keefer and Kennedy 2010). Quantitative estimates of habitat loss are not possible due to the lack of historical habitat data; however, loss of habitat and habitat degradation especially by invasive alien species are currently threatening the viability of this species in Canada (COSEWIC 2005). No data exists to provide evidence that Spalding's Campion previously occupied a larger range, though it has almost certainly decreased in abundance within its current range, so an objective to actively increase the number of populations is currently not suitable. However, in the event that other naturally occurring populations are found, they must be maintained as well. If long-term monitoring indicates overall population declines, active attempts to deliberately increase abundance will be considered appropriate.

6. Broad Strategies and General Approaches to Meet Objectives

6.1 Actions Already Completed or Currently Underway

With funding from the Aboriginal Funds for Species at Risk (2006-2008), the Tobacco Plains Indian Band implemented stewardship activities including control of invasive alien plants, removal of competing saplings to slow encroachment, and fencing of Spalding's Campion habitat to mitigate threats to the survival of the species. Some prescribed

burning has also taken place in recent years, and invasive plant pulling took place in 2009 and 2010.

A detailed survey of Tobacco Plains Reserve lands was completed in 2010, generating individual patch counts and knowledge of habitat preferences (Keefer and Kennedy 2010). Additionally, an inventory of invasive plants was completed as part of a Job Opportunities Project funded by the BC Invasive Plant Council in the same year. Invasive plant pulling also took place in 2009 and 2010.

6.2 Strategic Direction for Recovery

Table 3. Recovery Planning Table for the Spalding's Campion in Canada.

Threat (IUCN-CMP Threat #) or Limitation	Priority[8]	Broad Strategy to Recovery	General Description of Research and Management Approaches
All	Essential	Stewardship and Conservation	• Encourage First Nations and private landowner participation in habitat recovery and species/ecosystem conservation; promote private landowner/First Nation capacity in this regard • Work with private landowners/First Nations to identify effective ways to protect Spalding's Campion habitat, such as stewardship agreements and/or identification of local, provincial and federal government protection mechanisms • Assist private landowners/First Nations to develop best management practices • Work with private landowners/First Nations to evaluate the need for signage/ outreach to raise public awareness of the species and its critical habitat
Invasive non-native/alien species (#8.1); Agricultural & forestry effluents (#9.3); Fire and fire suppression (#7.1); Livestock farming and ranching (#2.3); Residential & commercial development (#1)	Essential	Site Management and Restoration	Work with private landowners/First Nations to: • design and implement an invasive alien plant (IAP) control program • develop guidelines and schedules for herbicide use in order to eliminate harmful effects of drift • design and implement prescribed burn program in areas where IAP control measures exist • design and implement a plan for increasing landscape connectivity between occupied sites • conduct thinning of encroaching saplings in the absence of prescribed burning and/or in areas heavily infested with IAP where burning could increase IAP spread • design and implement a phenologically appropriate livestock grazing schedule that minimizes threats to Spalding's Campion while also minimizing interference with ranching operations
Knowledge gaps: Population dynamics and viability; Livestock farming & ranching (#2.3); Problematic native species (#8.2); Invasive non-native/alien species (#8.1); Climate change (#11)	Necessary	Research and Monitoring	• Conduct research to determine population dynamics, demographics and genetic factors related to population viability of Spalding's Campion • Conduct research to determine extent and effects of known threats (IAP, recreational vehicles, fire suppression) and threats whose impact is unknown (domestic livestock grazing/trampling and problematic native species) • Conduct long-term population monitoring to evaluate effects of ongoing management activities on the Spalding's Campion population, including effects of fire on spread of IAP • Conduct research to determine population trends associated with climate change and/or weather variables such as prolonged drought
	Beneficial	Research and Monitoring	Establish experimental colony of Spalding's Campion to: • test feasibility of transplanting/growing from seed • test and refine habitat management techniques • generate seed stock for transplantation in suitable habitat that has few or no individuals

[8] "Priority" reflects the degree to which the broad strategy contributes directly to the recovery of the species or is an essential precursor to an approach that contributes to the recovery of the species.

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6.3 Narrative to Support the Recovery Planning Table

Stewardship and Conservation

Successful recovery of Spalding's Campion will depend first and foremost on successful stewardship (Table 3). Stewardship involves the voluntary cooperation of landowner/First Nations to protect species at risk and the ecosystems they rely on. It can include many different kinds of activities, such as following guidelines or best management practices to support species at risk, voluntarily protecting important areas of habitat on private property, establishing conservation covenants on property titles, eco-gifting portions of property to protect certain ecosystems or species at risk, or selling property for conservation.

In order to mitigate the threats imposed by off-road vehicle use and incidental trampling of current and potential Spalding's Campion sites, multi-jurisdictional support and involvement, as well as public education are necessary. Damaging recreational land use practices will need to be modified or redirected such that the location and/or intensity of activities are compatible with Spalding's Campion conservation.

Site Management and Restoration

An important approach to recovery will be to restore, to the extent possible, the structure and function of the fescue–needlegrass plant community that supports Spalding's Campion (Table 3). Invasive alien plant spread poses the primary threat to this habitat, and control of invasive plants will form a major component of habitat restoration and site management activities. This will likely require the targeted use of herbicides, which in turn requires a management plan to identify and minimize potential adverse effects such as herbicide drift.

Other site-specific habitat management plans will focus on ecologically appropriate prescribed burning plans, appropriate livestock grazing regimes, and improved landscape connectivity between occupied sites. Ongoing monitoring of recovery activities and habitat condition is also needed to assess the impact of management actions and modify management in response to results.

Research and Monitoring

Demographic studies should be conducted to determine basic population processes and identify details of key life stages that have thus far been relatively unstudied. Regular population surveys and monitoring are also needed to assess the distribution of Spalding's Campion and determine its ongoing viability and response to threats and management activities (i.e., knowledge gaps associated with key variables such as impacts of livestock grazing and ranching, problematic native species, invasive alien species, and climate change). To evaluate changes in the population over time, inventory and monitoring methods appropriate for Spalding's Campion must be developed that are robust enough for implementation by a variety of people over many years. Monitoring should be accurate enough to detect change, must be able to

be applied consistently across the range of the species to allow comparison, and must be practical, economical, and sustainable. Inventories should be conducted within an appropriate time-frame to allow conservation managers to distinguish trends from fluctuations, and for the rigorous testing of responses to management actions. Ideally, inventories will be conducted in early and late season, i.e., mid-June and again in late July to early August. Monitoring during these two time periods allows for the best observation of the various growth forms exhibited by Spalding's Campion (e.g., rosettes and erect vegetative or flowering stems) during the growing season, as well as an estimate of percentage of dormant plants from year to year.

7. Critical Habitat

7.1 Identification of the Species' Critical Habitat

Section 41 (1)(c) of SARA requires that recovery strategies include an identification of the species' critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction. The 2008 provincial recovery strategy for Spalding's Campion noted that critical habitat could not be identified at that time, owing to a lack of information on habitat and area requirements for the species. Environment Canada has reviewed the available information and concluded that sufficient information is available to identify critical habitat at this time.

A primary consideration in the identification of critical habitat is the amount, quality, and locations of habitat needed to achieve the population and distribution objectives. Critical habitat for Spalding's Campion is identified for known occurrences at Tobacco Plains in British Columbia. Owing to knowledge gaps relating to population size and fine scale distribution within the broader Tobacco Plains area, it is acknowledged that the current identification likely represents only a portion of critical habitat that is required for the species survival and recovery. The schedule of studies (Section 7.2) outlines the activities required to identify additional critical habitat necessary to support the population and distribution objectives for the species. More precise boundaries may be mapped, and additional critical habitat may be added in the future if additional information supports the inclusion of areas beyond those currently identified.

Spalding's Campion occurs in grassland ecosystems of the Tobacco Plains. Occupied habitats are typically dominated by fescue (*Festuca* spp.), with minor elements of shade (open range or open forest, typically <150 stems/ha), on shallow slopes (often less than 10%), frequently with northern aspects (RMTERSC 2006, Keefer and Kennedy 2010). Elements of partial shade/and or northern aspect appear to be optimal microhabitat features for the species, and may be associated with increased moisture retention/availability in relatively open/exposed grassland environments.

Critical habitat for Spalding's Campion in Canada is identified as the area occupied by individual plants or patches of plants that have been recorded, including the associated potential location error from Global Positioning System (GPS) units (ranging

from 13 m to 25 m uncertainty distance), plus an additional 50 meters (i.e., critical function zone distance[9]) to encompass immediately adjacent areas.

Based on the above methodology, a total of 40.8 ha of critical habitat is identified for Spalding Campion, as presented in Figures 3-5. Critical habitat for Spalding's Campion in Canada occurs within the shaded yellow polygon(s) (unit(s)) shown on each map. These detailed critical habitat units represent critical habitat, except for where existing anthropogenic features (e.g. buildings or other infrastructure, running surface of active roads) occur. These anthropogenic features do not possess the attributes required by Spalding's Campion and they are not identified as critical habitat. The 1 km x 1 km UTM grid overlay shown on these figures is a standardized national grid system that highlights the general geographic area containing critical habitat, for land use planning and/or environmental assessment purposes. Detailed methods and decision-making processes relating to critical habitat identification are archived in a supporting document.

[9] Critical function zone distance has been defined as the threshold habitat fragment size required for maintaining constituent microhabitat properties for a species (e.g., critical light, moisture, humidity levels necessary for survival). Existing research provides a logical basis for including a minimum critical function zone distance of 50 m as part of critical habitat for rare plant species occurrences. Accounting for up to a maximum of 100 m GPS error, the default critical function zone distance (in the absence of distinct ecological features), is a maximum 150 m.

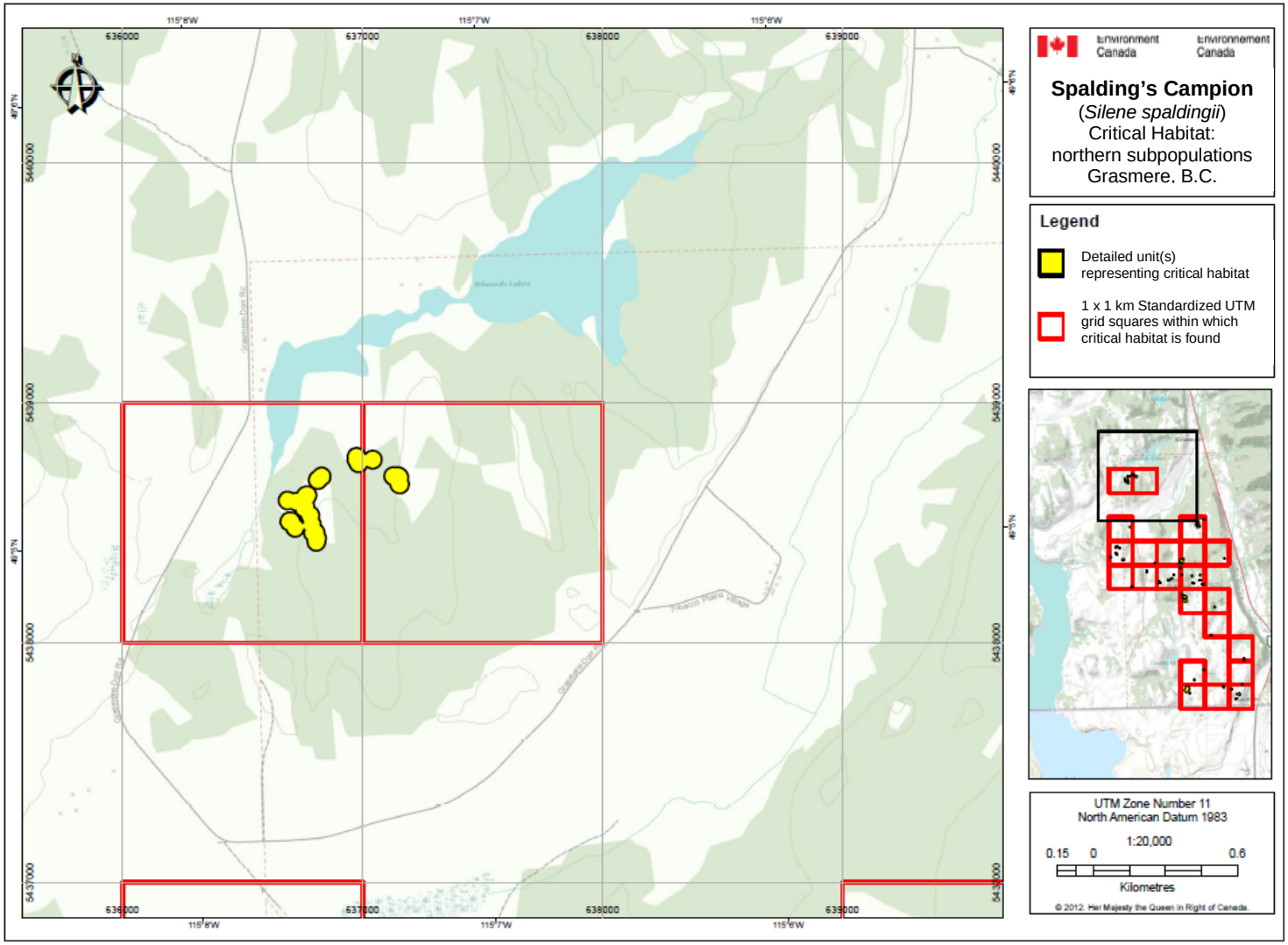

Figure 3. Critical habitat for Spalding's Campion at Grasmere, B.C. (northern subpopulations) is represented by the yellow shaded polygons (units), in accordance with the criteria and methodology set out in section 7.1. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area containing critical habitat. Areas outside of the shaded yellow polygons do not contain critical habitat.

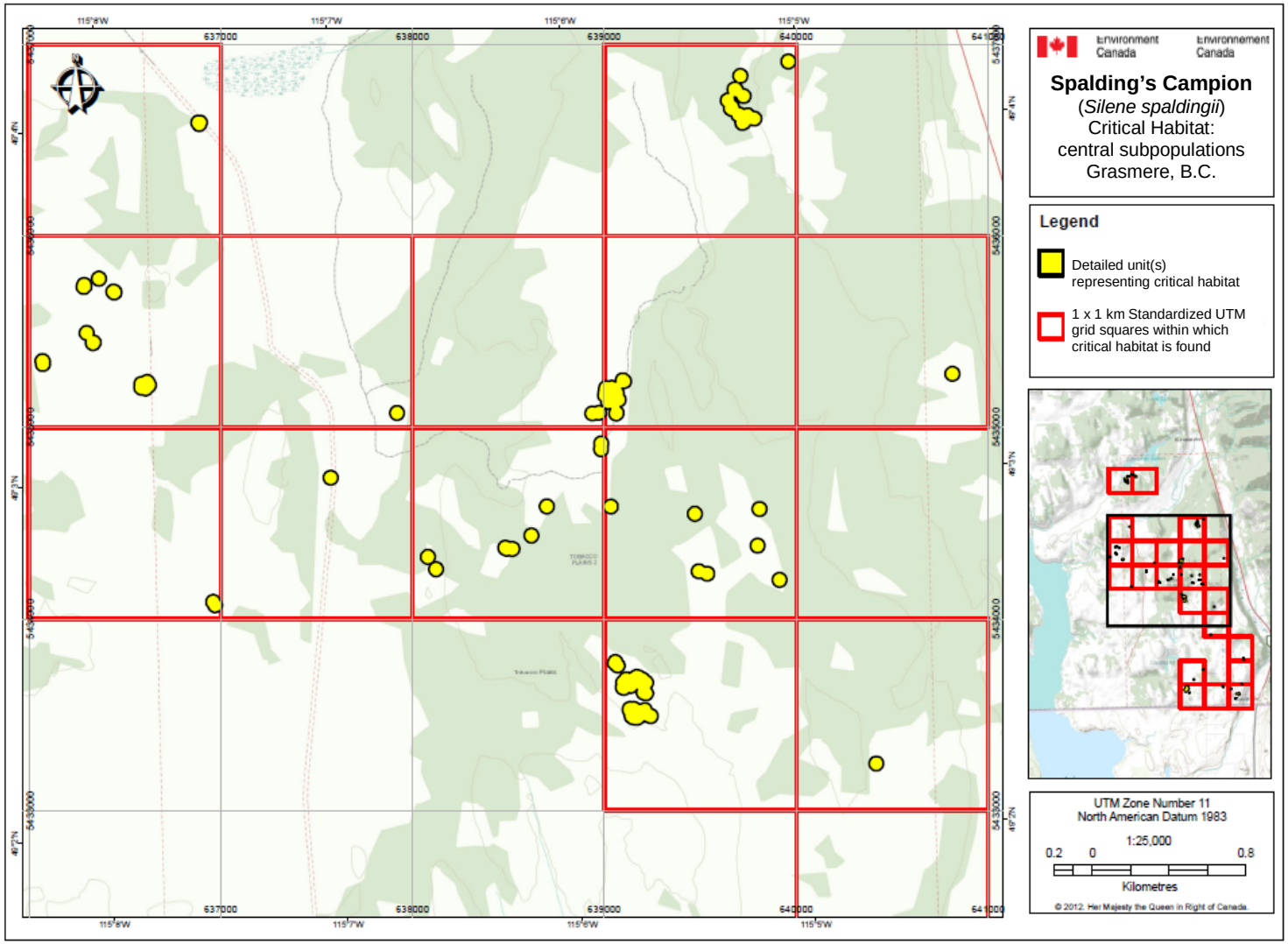

Figure 4. Critical habitat for Spalding's Campion at Grasmere, B.C. (central subpopulations) is represented by the yellow shaded polygons (units), in accordance with the criteria and methodology set out in section 7.1. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area containing critical habitat. Areas outside of the shaded yellow polygons do not contain critical habitat.

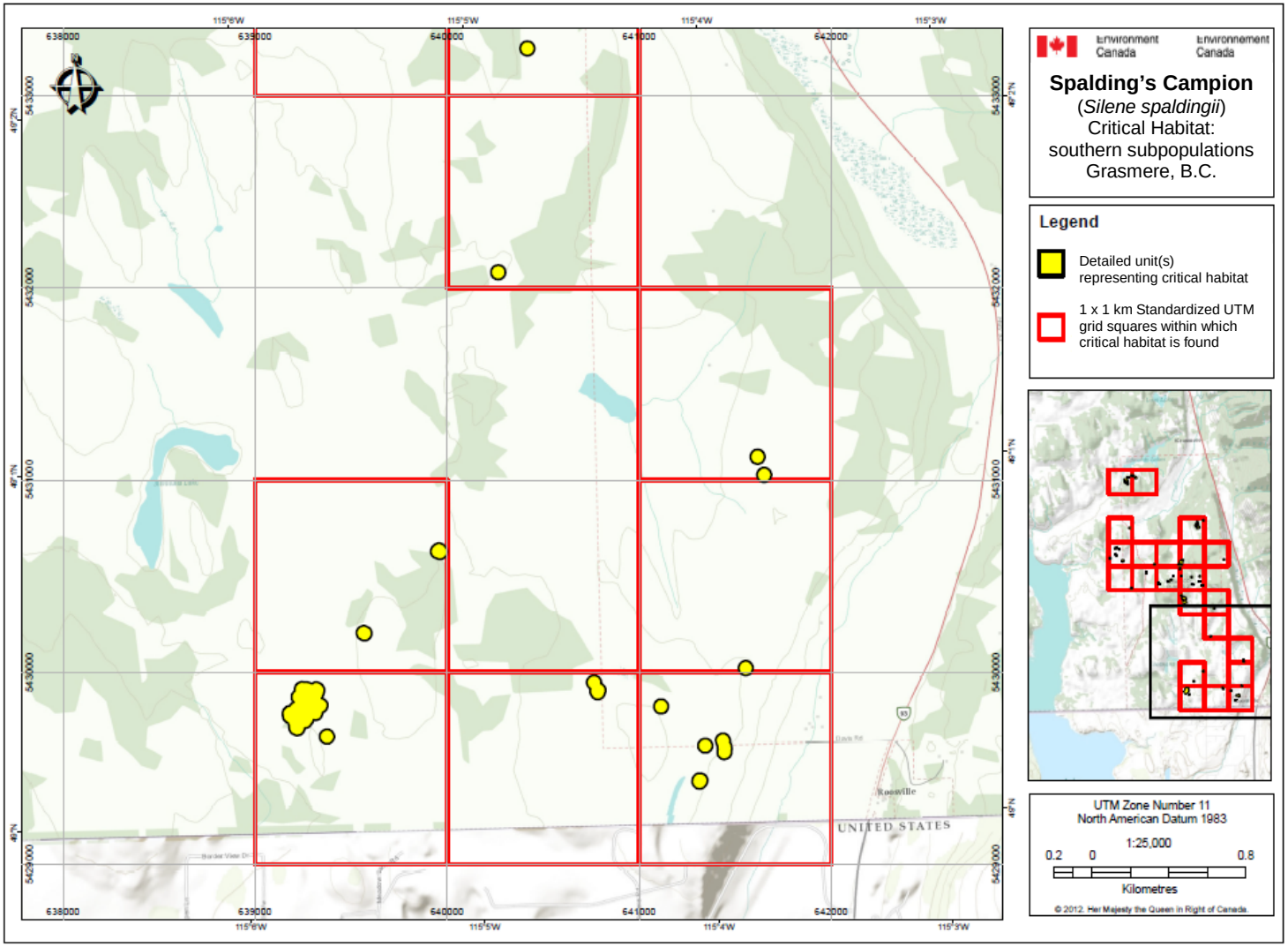

Figure 5. Critical habitat for Spalding's Campion at Grasmere, B.C. (southern subpopulations) is represented by the yellow shaded polygons (units), in accordance with the criteria and methodology set out in section 7.1. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area containing critical habitat. Areas outside of the shaded yellow polygons do not contain critical habitat.

7.2 Schedule of Studies to Identify Critical Habitat

The following schedule of studies (Table 4) outlines the activity required to complete the identification of critical habitat for the population of Spalding's Campion occurring at Tobacco Plains, near Grasmere (East Kootenay) British Columbia.

A predictive habitat model developed by Keefer Ecological Services (2010) resulted in finding a significantly larger population than was previously known on federal lands. Proportionally less surveys and population monitoring have been completed on non-federal lands. Comprehensive inventory in unsurveyed areas (particularly those identified as having high potential habitat suitability) is required to determine the full range of Spalding's Campion in Canada.

Table 4. Schedule of Studies to Identify Critical Habitat.

Description of Activity	Rationale	Timeline
Conduct targeted surveys in areas of suitable habitat based on the predictive habitat model (developed in 2010) as well as knowledge of habitat preferences: • search should include areas near other individuals from the BC-Montana border up to the northern extent of Rough Fescue and Ponderosa Pine ecosystems • areas identified as high potential habitat suitability should be surveyed in at least three consecutive years to account for possible dormancy and/or easily-overlooked rosette form	This activity is required such that all extant occurrences are identified and sufficient critical habitat is identified to meet the population and distribution objectives.	2016 – 2021
Use information gained by additional/new occurrences to further develop and refine habitat model for application throughout the species' range. Depending on the model's accuracy, the methodology for critical habitat identification should be modified to include high-suitability habitat types, as compared to the current occurrence-based identification.	These new criteria may be used to identify additional critical habitat throughout the species' range in southern B.C., including connective habitat required for recruitment and because existing individuals may escape detection due to prolonged dormancy.	2016 – 2021

7.3 Activities Likely to Result in the Destruction of Critical Habitat

Understanding what constitutes destruction of critical habitat is necessary for the protection and management of critical habitat. Destruction is determined on a case by case basis. Destruction of critical habitat would result if any part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from single or multiple activities at one point in time or from the cumulative effects of one or more activities over time (Government of Canada 2009). Activities described in Table 5 include those

likely to cause destruction of critical habitat for the species; however, destructive activities are not limited to those listed.

Table 5. Examples of activities likely to result in destruction of Spalding's Campion critical habitat.

Description of Activity	Description of effect in relation to function loss	Details of effect (including related threat, scope, and thresholds)
Introduction of invasive alien plants (e.g. deliberately sown for cattle forage, and/or inadvertent introduction by not adhering to best management practices to control alien invasive species)	Invasive alien plants can change community composition, function and affect the availability of water, light and nutrients, effectively degrading critical habitat to the point where it no longer supports Spalding's Campion	IUCN Threat # 8.1. Introductions can be detrimental either within or outside the bounds of critical habitat; nearby infestation can spread. The introduction of a single invasive individual is capable of eventually destroying critical habitat through spread.
Inappropriate fire management related to deliberate fire suppression	Decreased fire frequency allows litter accumulation and encroachment of woody species; increased fire frequency and/or intensity (through litter buildup) destroys habitat and encourages establishment of invasive alien plants	IUCN Threat # 7.1. This activity has both cumulative and direct effects: (a) fire suppression allows woody encroachment and thatch buildup that can make habitat unsuitable for Spalding's Campion (cumulative); (b) fuel buildup increases fire severity so humic layer burns and destroys habitat, favouring establishment of invasive alien plants (direct).
Conversion of natural landscape for human use and development	Results in direct loss of habitat through vegetation removal or replacement, debris deposition, or impact by machinery	IUCN Threat # 1.1, 1.2.
Use of ATVs or other vehicles outside of existing roads and trails	Soil compaction and loss of vegetation leading to changes in hydrology, increased erosion, spread of invasive alien plant species and decreased seed germination	IUCN Threat # 6.1. This activity has both cumulative and direct effects. Applicable year-round but less so in winter when the ground is frozen. Can destroy critical habitat with only one occurrence (i.e. spread of invasive plants, some soil compaction).
Intensive livestock use	Heavy grazing may destroy critical habitat through soil compaction, introduction of invasive alien species and alteration of native plant community structure and function	IUCN Threat # 2.3. This activity has both cumulative and direct effects. Insufficient information exists to assign thresholds. Grazing effects interact with those of fire suppression, as the loss of productive grassland habitat in fire-suppressed areas (through woody encroachment and invasive plant spread) results in the spatial concentration of grazing and thus intensification of grazing effects.
Inappropriate use of herbicides in invasive plant management activities	Herbicide drift may degrade critical habitat through residual effects, wind drift, incidental application, and altering the composition and structure of the native plant communities	IUCN Threat # 9.3. Does not need to occur within the bounds of critical habitat to cause destruction. This activity can have both cumulative and direct effects. Threshold for tolerance is unknown.

8. Measuring Progress

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives:

- The distribution of Spalding's Campion in Canada has been maintained (i.e., extent of occurrence has not decreased);
- The abundance of Spalding's Campion in Canada has been maintained (i.e., population size has not decreased);
- The distribution and abundance of Spalding's Campion in Canada is increased, where appropriate, through newly identified and/or restored occurrences.

Measurements are to allow for annual effects (e.g. dormancy), and related variation in annual monitoring results, i.e., trends in repeated annual estimates are to be evaluated over the course of a longer time period, for example, over a five year interval.

9. Statement on Action Plans

One or more action plans for Spalding's Campion will be posted on the Species at Risk Public Registry by 2021.

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Appendix A: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*[10]. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the Federal Sustainable Development Strategy's[11] (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

Spalding's Campion occurs in the same habitat as other species at risk found in Ponderosa Pine--Rough Fescue grassland ecosystems, including the Long-billed Curlew (*Numenius americanus)*, Lewis' Woodpecker (*Melanerpes lewis*), Western Toad (*Anaxyrus boreas*), Leopard Frog (*Lithobates pipiens*), Painted Turtle (*Chrysemys picta*), and the American Badger (*Taxidea taxus*). Most recovery activities proposed for Spalding's Campion (site protection, habitat enhancement, and threat mitigation) can be expected to have a positive effect on the habitat of these other non-target species. However, it is possible that specific management actions carried out during the course of Spalding's Campion recovery (e.g. invasive alien plant species removal, sapling thinning and spacing or fire regime implementation) could have unforeseen effects on non-target species. While likely small, the chances of negative effects occurring due to recovery activities must be considered. In keeping with the principles of adaptive management, an important component of recovery action planning will be anticipating and monitoring potential collateral effects (both positive and negative) on non-target species, communities, and ecological processes.

To ensure that recovery actions for one species do not hinder the recovery of another, collaboration with key conservation partners such as the Tobacco Plains Indian Band and appropriate government agencies is essential. Recovery planning activities Spalding's Campion will be implemented with consideration for all co-occurring species at risk, such that there are no negative impacts to these species or their habitats.

[10] http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[11] http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1